





ON June 27, 1542, a venturesome Spanish explorer set sail from Navidad, in Mexico, with two small vessels, the *San Salvador* and the *Victoria*. After toiling northwest for three months, he was attracted by a great headland that ran out into the ocean, and he drew into the shelter of a pleasant, sunny bay. The Spanish explorer

was Juan Rodriguez Cabrillo (Hoo'-ahn Roe-dreck' Cah-breel'-lo). He had been sent north by Hernando Cortes, the conqueror and governor of Mexico. The headland that attracted his attention is now called Point Loma; the waters in which he rested anchor are now San Diego Bay; and the mainland on which he stepped is now called California. He exchanged gifts with the friendly natives—then sailed on again to search for the mythical Northwest Passage. After touching at Catalina Island, San Pedro and other points, he entered the Bay of Monterey in November. Winter came on and drove him back to the Santa Barbara Islands, where he died January 3, 1543. Cabrillo, the discoverer of California, rests in an unknown grave on one of the islands of the channel. His trip was followed by other expeditions, notable among which was that of the great explorer, Francis Drake, who in 1579 entered a bay about thirty miles north of San Francisco. Some dozen years later Phillip II, king of Spain, commanded that the entire coast of California be searched; and as a result a fuller knowledge of the shore line was obtained.

Why the name California? Some claim that it is formed of two Spanish words meaning "hot furnace," but this fails to explain itself, for the early Spaniards who first used the name found the country not hot, but actually cold, in comparison with what they were accustomed to. The name California was undoubtedly taken from the novel "Las Sergas de Esplandian," written by Ordenez de Montalvo. This book was popular in Spain about this time. In the course of the story a mythical "California" is described as a land "on the right hand of the Indies, very close to the terrestrial paradise."

After various excursions to the new coast, there was, apparently, no increase of knowledge for 150 years. California was supposed to be an island or group of islands. A few Jesuit missionaries penetrated the interior of Lower California about 1700 and remained there for sixty years. No other interest was shown until about 1770, when San Diego and Monterey were occupied by the Spaniards, and San Francisco Bay was discovered.

During the years thereafter the American Revolutionary War was waged, also the French Revolution; and Napoleon came, conquered much of Europe, and passed away—but in distant California these things were unknown. The only

significant thing there was the appearance in 1796 of an American vessel, which cast anchor in the harbor of Monterey. Its name was the *Oller*, and it came from Boston. This was the first of many American trading vessels that carried goods to the coast.

Then came the Franciscan Mission period, which is referred to elsewhere in this number of *The Mentor*. During the first twenty years of the nineteenth century the Missions were scenes of great activity. They kept peace and cultivated industry among the people.

The political disturbances of Spain and Mexico during the early part of the nineteenth century were scarcely known in this far away province. When a revolution broke out in Mexico in 1811, California remained loyal to the Spanish crown—and suffered thereby a great deal in loss of business with Mexico. After a few years of mild disturbances, the Spanish constitution was sworn to in California in 1820, and in 1822 allegiance was given to Mexico. Under the federal constitution of Mexico, California in 1824 received a representation in the Mexican Congress.

Then followed for several years a complicated movement in the affairs of the province, which upset many old institutions and laid the foundations for new ones. The Missions were disrupted and partially destroyed. Immigration increased, bringing new figures and new influences into the life of the country.

The Russians had worked their way down from Alaska, had secured a foothold on the southern coast, and, in spite of the opposition of the Spaniards, had established a few settlements. But they did not thrive, and about 1840 they left. The Mexican régime had begun. Los Angeles was selected as the capital, and a Mexican governor chosen—to the dissatisfaction of the native Californians, who decided to furnish their own governor. Alvarado was the leader of this movement, and, after a brisk but almost bloodless little revolution, he became master in Southern California.

In 1839, along came John Sutter, and then followed a flood of immigration from the East and the war with Mexico that gave California to the United States—after that, the discovery of gold and the feverish rush of fortune seekers to the Coast. This is a story of its own, which will be told later in *The Mentor*.



THE old Missions of California (and the most celebrated are in the southern half of the State) are among the most interesting things to be seen in that country. They form an important part of the history of California, and a most appealing and picturesque feature of the landscape. There are twenty-one Missions in

all, and they are strewn along the coast from San Diego to San Francisco, "a day's walk apart," as the barefoot Franciscan friars of the last century were wont to say. Most of them are in ruins, but still bespeak their sacred character—with a special dignity conferred by time. So long, it has been said, as one stone remains upon another and a single arch of these Mission chapels stands, an atmosphere will be there that will breathe the spirit of consecration. They are religious symbols of the Old World, and they whisper to the present day a story of devoted, patient labor and spiritual zeal.

In the middle of the eighteenth century Spain, seeking to colonize some of its own territory in California—which was then peopled only by native Indian tribes—made an arrangement with the Order of St. Francis to establish Missions in the new land, so that Spanish subjects might be encouraged to go there. By the terms of that arrangement the Franciscans were to have possession of their Missions and the revenues therefrom for ten years, that being considered as sufficient time for fully establishing the colonies. The property was then to revert to the Spanish throne. The Franciscans, however, were left in full possession for more than half a century. The Missions were begun at San Diego in 1769 by that extraordinary Apostle of California, Junipero Serra. Born in the island of Majorca in 1713, he came early to the New World with the thought of converting the savage Indians; and after remarkable achievements in Mexico, was made Father President of the projected Missions of California. From Vera Cruz, Mexico, to San Francisco, California, and back and forth along his line of Missions, and to the city of Mexico, he traveled many times afoot, though always suffer-

ing with an unhealed wound in his leg. He lived to see his dream fulfilled; a line of Missions along the golden shore of California, and tens of thousands of savages brought not only into the church, but taught all the arts and crafts of civilization. The architecture of these Missions, built by rude Indians under the direction of the Franciscan friars, has had more influence on the architecture of modern California than all other "schools" combined. It follows the ancient Spanish, so far as rude materials and unskilled workmen could follow; and is characterized by massiveness, simplicity, dignity, and a fine sense of proportion.

Books have been written about the Missions, and their stories have been told many times. For years, over the peaceful valleys, the Mission bells were heard summoning the primitive Indian people to worship. The Spaniards and Indians worked together in peace and harmony. Prosperity and brotherly feeling prevailed, and the Mission houses were homes of shelter and spiritual consolation. In later years the Mission chapels and all that they stood for fell upon evil days.

The Missions were "disestablished" by the Mexican Government in 1834; the Indians were scattered to the winds, and the buildings pillaged. In the last generation the Landmarks Club of California, a philanthropic organization, has been preserving the weathered remnants of these noble monuments, which are visited by hundreds of thousands of tourists a year. A token of the honor in which Serra is held in modern times is the memorial cross on Mt. Rubidoux in Riverside, overlooking the richest valley in Southern California. Easter services are held here at sunrise yearly, with sometimes ten thousand people in attendance.



SOUTHERN CALIFORNIA means to most people a land of sunshine and flowers—and oranges. The orange groves and year-round flowers, and the fertile land west of the mountain range that traverses California from end to end, appeal to the great majority of travelers. Many in crossing the great desert wastes to reach

the garden lands of California are troubled by the temperature, the desolate sand sweeps and the barren brown hills. Many take no pains to study the desert, even through the car window. But the artist and the thoughtful observer find it one of the most appealing features of this wonderful, diverse half-state. Books have been written about the desert, and painters have devoted many canvases to it. The miner, the explorer and rover, find in the desert half of Southern California some of its most striking features in atmospheric effects, in topography, adventure, and in resources. The ordinary traveler thinks chiefly of California fruit—and that is quite natural, for the land is a paradise of fruit production. But Southern California is a country of many varied kinds. The casual traveler, as he crosses the wastes of sand, is perhaps unaware of the wealth that has been drawn from the desert and the purple hills that skirt it. More than nine-tenths of the borax product of the country comes from that desert spot of dreadful name—Death Valley. Granite and marble come from the hills of San Bernardino. Coal, crystal, fine rose quartz and precious stones are mined. The rare pink beryl and bright topaz are found in San Diego County. And one of the most curious harvests of California is that of salt. In the valley of the Colorado River there are vast low depressions which were once the bed of salt seas. Of course nothing grows there. But the saline deposits of ages have left a vast bed of salt of exceptional purity. What a contrast! Over on the other side of the great mountains is a paradise of orange groves and a

soft climate. Here in the valley of the Colorado River is a dry salt lake.

Among the most striking paradoxes of Southern California, and the most important commercially, is the sudden development of petroleum. Only a third of a century after the most important geologic authority in the country had stated in an important text book that California could never be an oil producer, and certainly could not have spouting wells, oil was "struck"; and California has now become the most important oil region in the world, where an oil company is much disappointed if it does not strike a "gusher." And these wells are not only pumping oil from the soil in the valley and on mountain side, but even from under the waters of the Pacific. A forest of derricks in the western outskirts of the city of Los Angeles tells the story of petroleum there. The accompanying illustration pictures a host of derricks that have pushed their way hundreds of feet seaward beyond low tide, where they are busily engaged in drawing oil up through the salt waters of the ocean. These are the pumping wells at Summerland, California, a short distance from Santa Barbara. When an industry like that of petroleum "goes to sea" it offers a curious scenic spectacle. Where we would expect to find only the long sweep of the surf and children playing in the sand, a new and rapidly developing industry finds profitable occupation.

California petroleum is of many varied grades and serves for refining, and, in its crude state, is used as fuel for railroads and factories. Mixed with the nearby gravels it forms the base of good roads and makes a boulevard of the highest class.



ONE of the most striking things about Southern California is the striking geographical contrast that it presents within a short range. Travelers find it an "experience" to play snow-ball at ten o'clock in the morning in front of a comfortable hotel on the Sierra Madre, (see-er'-rah mah'-dre) and at one o'clock on the same day to

take a swim in the Pacific surf at Santa Monica or Long Beach. From the mountain they can see the ocean, from the ocean the mountain. From cool and fertile hills they can gaze upon merciless stretches of sand. From the desert they can see the green hills. Even more striking are the contrasts at such points as Pasadena, Pomona, Redlands and Riverside. Here one may stand in a grove whose orange trees are heavy with ripe fruit, green fruit and new blossoms; with roses, geraniums and other flowers in a riotous profusion along the hedges—and look up to see snow ten feet deep on mountains whose bases are not three miles away, nor their summits ten. The view from Smiley's will disclose in one direction miles of barren desert; and then immediately adjoining, a stretch of richly cultivated land. On the heights ice and snow; in the hollows hot sand. On the left a desolate waste; on the right a paradise of flowers and fruit.

One explanation of the great natural contrasts is the suddenness of the rise of the Sierra Madre above a very low plain. Mount San Bernardino is 11,800 feet high, and as viewed from Redlands, some fourteen miles away, it is about a net 11,000 feet above the point of view. At Pasadena, which is only about 600 feet above sea level, one sees Mount Wilson, only five miles away, rising 5,600 feet. At Pomona and Ontario and their sister towns, one looks up to Mount San Antonio, 10,000 feet from a level of only about 700 feet. So much has been written about the great deserts of California, the Imperial Valley, the lowlands and all, that many travelers who go there think that deserts with low purple hills on the horizon are all they are to see, and they are surprised at these amazing geographical contrasts. It is not uncommon to hear visitors exclaim at the

steep mountain ascents that lift up from the very ocean side: "This is not the California that we looked for." The superb heights, rising precipitately from the water, strike the traveler with amazement. The desert, it seems, was left behind him when he crossed the Sierras. He is now apparently on the Riviera.

The three hundred mile shore line of Southern California along the Pacific has much to do, not only with the climate, but with the pleasures of the people and their visitors. There are scores of popular beach resorts, extending from San Diego north, and the islands that lie off the coast are much frequented. Thirty miles out in the ocean, about due south of Los Angeles, rises Catalina from the sea, a many-peaked mountain isle, varying in width from half a mile to nine miles, and more than twenty in length. Its abrupt cliffs are broken by occasional stretches of beach. The most famous of these is the enchanting Bay of Avalon, with its 4,000-foot peaks and its clear waters as blue as the Mediterranean. Through glass-bottomed skiffs, especially made for the purpose, you may gaze down through "one hundred feet of transparency to where emerald weeds wave and myriad fishes, blue and brown and flaming red, swim over pebble and shell." Catalina is famous for its fishing. The barracuda is in quantity there, and the sea salmon, sea bass, and the great gamy fish, the tuna. Catalina finds favor with travelers because of its unusual character. It seems to some "so foreign." The coast resorts are all delightful, but most of them present features that are familiar to any American who dwells near the sea. But Catalina Island and the Bay of Avalon have special charms of their own, and they transport the visitor from familiar seashore things to what seems a distant clime.



THOSE of us that have read "Ramona"—by this time surely several million in number—will know the meaning of this picture. It shows the front of the old ranch house at Camulos—with its century plant in bloom. There on that upper porch Señor Felipe (sane'-yor fel'-eep) ill of a fever, lay on the pallet of hide that Alessandro

made for him. Along that shaded portico walked Señora Moreno (sane-yor'-rah) (mo-ray'-no) with bowed head and serious face, counting her beads. In that room behind the barred window between the butresses, Ramona had her little sanctuary. There when separated from Alessandro she gave her soul to prayer, and her heart to her lover.

At least so the story tells us, and so vivid and vital is it all that the characters of Mrs. Jackson's creation seem more real to us than the people that actually live at Camulos now.

The story of Ramona is the classic of Southern California. It is the "Uncle Tom's Cabin" of the southwestern Indian—and it is said that more copies of it have been sold than of any other book except Mrs. Stowe's immortal story. Helen Hunt Jackson, the author of "Ramona," was a practical crusader. She was prompted to write this story by a sense of indignation at the manner in which the Government had robbed the Indians of their land and driven them from their native homes. She traveled very extensively in the Indian region, learning her facts at first hand. Then she wrote a number of documents appealing to the Government and to the public for justice and fair dealing for the Indians of California. Finally it came to her mind, as she thought of Mrs. Stowe and "Uncle Tom's Cabin," that she could plead the cause of the Indian more eloquently in story form—and so she wrote "Ramona." She was conscious chiefly of a serious purpose in writing this book. She was not conscious of creating a beautiful masterpiece of fiction. She was so thoroughly imbued with the spirit that prompted her work that she breathed into it the very breath of life. There are many today that believe that Ramona, Alessandro and Señora Moreno really lived. The home and marriage place and other scenes in the life of Ramona are pointed out to the traveler as actual historical spots. Unfortunately, this disposition on the part of devoted readers of the book has carried some too far, and some characters and places are pointed out that are not even

mentioned in the book—so that the visitor, laboring under conflicting statements, is apt to become confused.

As a matter of fact, the book is fiction, and Ramona and Alessandro are creations of the author. So are nearly all the other characters in the book, though some of them were suggested to the author by persons actually living. The novel was written largely in the hospitable Spanish home of Don Antonio F. Coronel, in Los Angeles. Mrs. Jackson brought letters to him and was a guest of his during the preparation of "Ramona." She asked him and his wife, Doña Mariana, for a typical Spanish rancho in which to locate the beginning of her story. They told her that the most typical and the last surviving of these old places was the Camulos plantation, in Ventura County, and they gave her introductions to its people. Mrs. Jackson paid Camulos one brief visit—that was all. But her description of the plantation, the people, the sheep-shearing, the scenic surroundings, and the details of the old house, are almost photographic. The sheep, the crosses on the hill tops, the olive and other groves, are still there—and even the torn altar cloth which caught Mrs. Jackson's sympathetic attention and which she introduced into her story as a beautiful bit of Ramona's handiwork.

Camulos was one of the largest of the old Spanish ranchos in California, and is the only one which has retained its unspoiled character from the patriarchal days of seventy-five years ago. It is owned by the descendants of its founders, the Del Valles, whose guest Mrs. Jackson was over a third of a century ago. This novel has not only had an enormous circulation, but has exerted a profound material influence on the development of Southern California. It is the most widely read book on California today, despite its age. One who is foremost in knowledge and experience as to the "tourist crop" deems it a conservative estimate that this novel has been worth \$50,000,000 to Southern California.





THE towns of Southern California are refreshing spots in the midst of desert lands. Look down from Smiley Heights on the beautiful town of Redlands. Its gardens and orchards and broad spreading trees form an emerald oasis in the sandy valley. The same may be said of Riverside and other towns that have sprung like

flowers from the desert soil. When we come down through the Cajon (cah-hôn') Pass and enter the town of San Bernardino, (behr-nahr-dee-nô') we find ourselves in the midst of orchards—peach, apricot, olive, almond, prune, fig, and the sunny orange, the prince of all the California fruits. The streets of these towns are wide, and as clean as a well-swept hall. The sidewalks are lined with palm trees, pepper, live oak, or that Australian visitor, the eucalyptus, which has entered so genially and usefully into the life of its adopted country. The life of these towns is happy, carefree and leisurely. In the soft climate people enjoy health and happiness—and they say they do not grow old.

Each of the residential places of Southern California has a charm of its own, and Pasadena is the gem of them all. It is a thriving and beautiful city of 35,000 inhabitants. The name is derived from the Spanish *Paso de Eden*, which means the "threshold of Eden." Well named it is, for the town is indeed an Eden in beauty—and it has been for years the threshold over which thousands of Eastern visitors have passed to spend the winter in this earthly Paradise. The handsome residences and hotels of Pasadena are famous. Orange Avenue is one of the most beautiful residential streets in the world.

Southern California has two important cities—San Diego and Los Angeles—both of which have grown amazingly in the course of a few years. San Diego had a population in 1910 of about 40,000. Today it numbers nearly 90,000. Los Angeles in 1910 had a population of about 320,000. That number is now almost doubled.

San Diego is the place of beginnings in Southern California. It was there that Cabrillo first set foot on Californian soil. There the first wooden cross was set and the first Mission was established. The Mission fathers began there to till the soil and produce the first palms, the first vine and the first olive tree. The first irrigation system was established there, and the original dam is still standing. Today there are two San Diegos. One—the Old Town—is reminiscent of primitive days. Its streets are lined with old adobe buildings. The Mission building is there, and the visitor may ring the old bells, which were brought from Spain. The new San Diego is a modern city, with fine streets

lined with high buildings and luxurious hotels. There is much to see and do in San Diego. There are trips that will carry the traveler to points of exquisite beauty. Besides the Old Town, the visitor finds diversion and interest in the ride out to Point Loma and the old lighthouse; to Coronado Beach, Coronado Tent Village, and then along the narrow strip called the Silver Strand, down to the queer old Mexican village of Tia Juana (Tee'ah Hwah'-na.) The Exposition has given a particular interest to San Diego during the past year, and has drawn many visitors there. The buildings and bridges and other structures—some of which are permanent—have been set in beautiful Balboa Park, where the palms and cactus abound and the soil is covered with many-colored flowering plants.

Los Angeles is a large, modern city. In appearance the business streets do not especially suggest California, but are quite like those of many other great cities. It is when we leave the commercial thoroughfares and turn into Adams Street or drive through the parks that we come to appreciate the abiding charm of Los Angeles. The architecture of the homes is varied and attractive. The lawns are fresh and green, and the houses are clad in robes of ivy or flowering vines. It is a city of a thousand delights, offering many alluring spots to the visitor. Pasadena is only a few miles away—and other beautiful towns. The beach is only a half hour distant, and there the visitor may divert himself for days in a succession of busy seaside resorts. Should he choose to go further still, he may take the boat from San Pedro and visit lovely Catalina Island.

No one should leave the coast of Southern California without a visit to quaint and charming Santa Barbara, long known to the world as "The American Mentone." The town is set in a most attractive spot, with a long sloping beach before it and high mountains behind it. Here there are fine hotels, a perfect fairyland of homes, and the Old Mission, which is of all the Californian Missions the most perfectly preserved, and in which the Franciscan Brotherhood still lives and worships. Besides Santa Barbara, there is Montecito, Summerland, San Buena Ventura (sahn bway'-nah ven-too'-rah) and many another interesting place on or near the coast of Southern California. The visitor tears himself reluctantly from those inspiring scenes.

THE MENTOR · DEPARTMENT OF TRAVEL
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SAN LUIS REY MISSION

The second oldest Mission in California, situated north of San Diego. Picture taken before restorations were made

SOUTHERN CALIFORNIA

By CHARLES F. LUMMIS

MENTOR GRAVURES

THE JUNIPERO SERRA CROSS ON MOUNT RUBIDOUX, NEAR RIVERSIDE · FRANCISCAN MISSION AT SANTA BARBARA · CAMULOS, THE "HOME OF RAMONA" · OIL WELLS IN PACIFIC OCEAN, SUMMERLAND · THE BAY OF AVALON, SANTA CATALINA ISLAND
RAVINE BETWEEN LOS ANGELES AND PASADENA



ALTHOUGH California is longer than from Boston to Charleston, and wider than the State of New York; while the area of its fifty-eight counties is nearly that of Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York and Pennsylvania put together (or Prussia, Saxony, Würtemberg, Baden and Alsace-Lorraine combined; or England, Ireland, Scotland, Wales, Barbados, Bermuda, Malta, Mauritius, the Straits Settlements, Cyprus and Hong Kong in a bunch; or our Philippines, Hawaii, Puerto Rico, Samoa and Guam, with room for Massachusetts and Connecticut besides)—*California is one State!*

For decades there have been sporadic attempts to "divide" it, like the Carolinas—solely because of the discomfort of so many in having to travel as far as from Boston to Buffalo to reach the State capital. But none of these crusades has amounted to a paper of safety pins. The romance of California has been stronger than its selfishness. It is the only "Wedded State"—the virile North with its Greater Alps, its incomparable trees, roaring rivers, 1,500 glacial lakes and even surviving glaciers; the feminine South, with its cordial sun, its native palms, its gaunt, great ranges, its riverless rivers (save in winter flood), its mirage-like valleys (which I tramped a third of a century ago as deserts, and have seen the hand of

man translate to Eden), its Gardens of the Hesperides, its incomparable range of productivity, from gold and oranges to oil (in each of which it out-yields any equal area), and its unprecedented growth of a selective population.

If "figures cannot lie" (they are tiresome anyhow), we live our lives not by arithmetic but by averages. Statistics are half misleading—for they do not lead most of us at all.

But comparison and simile are friendly guides. No one can comprehend California without measuring its physical and other features by more familiar yardsticks.

One as California is on the map, it has for twenty-five years been "divided" in the public mind here and abroad.

To the average traveler, "California" means practically from Santa Barbara to San Diego and their immediate valleys; their huge "Back Country" an almost unknown matrix for these now famous gems.



CLIMATIC CONTRASTS

Orange trees to the left, 100-foot Australian Eucalyptus trees to right, snowcapped Mount San Bernardino (11,800 feet) in the back

Climate

"Southern California"—a popular but not a political entity—is differentiated from the other sections of the State, not so much by parallels of latitude as by a strange physical fencing apart. A thousand miles of Mount Washington's wall California from the easterly deserts, and turn their wonderful slope to the Sunset Sea. But Southern California begins where California, "The Right Arm of the Continent" (as I called it long ago; and look at your map to see) bends its mighty elbow of a coast-line at Point Concepcion. San Francisco is as far *west* of San Diego as *north*; California "leans out" upon the Pacific as the Atlantic seaboard upon its own ocean from Boston to Florida. And each ocean responds in terms of climate. As the warm Gulf Stream dampens the Eastern coast so far north as it can follow, so the vast cold flood of the Kuro Siwo (Japan Current) swinging back from Alaska, chills the north Pacific Coast, and gives Oregon its tremendous rains and San Francisco its volleying fogs. But at the sharp elbow of Concepcion it

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keeps straight on, far outside the flanking islands of Southern California, and never touches the American coast again.

This is the simple explanation why there is, in the southern third of California's great reach, about half the rainfall of the northern two-thirds, about 50 per cent. more hours of sunshine, about 50 per cent. less average dampness in the air. It is why people can sit on porches every day of the year; and "in winter" thousands go to the peaks to snowball, high as Mount Washington, and after two hours by electric car go swimming in the Pacific surf. It explains the 40,000 carloads of lemons and oranges a year. It explains the stalwart legs and arms and necks and chests of the youngsters—they live outdoors. It also explains why a city the size of Worcester, Massachusetts, is added to the population every year. It means, I hope, that the prophecy of Bayard Taylor, seventy years ago, was not hollow: "Here there will at last be a *happy* American-born race. . . . Nature must be false to her promise, or man is not the splendid creature he once was, if the art and literature and philosophy of Ancient Greece are not one day rivaled on this last of inhabited shores!"

The climatic "range" of Southern California is a vital factor in any consideration of it. It includes the highest mountain in the United States (Alaska excepted). Mount Whitney is 14,898 feet—more than twice the height of Mount Washington. Almost at its foot is Death Valley, the lowest depression in all the New World, 480 feet below sea-level. No other "Jumping-off Place" in the world is so startling. The familiar parallel is Mount Moab (4,400 feet) and the Dead Sea, 1,295 feet lower than the Mediterranean. But that is only a 5,695-foot "drop" compared to Whitney's 15,378. East of the great Sierra Madre (Mother Range) is mostly a desert as stark as the Sahara. West of it is a paradise. Pine and cypress and palm, apple and orange, peach, lemon and pineapple, corn, wheat and



A BIT OF COAST NEAR SAN DIEGO

The shore of Southern California is rugged and mountainous in places



FERTILE VALLEY LAND

View from Smiley Heights, Redlands

cotton—all thrive at their proper levels. The new-planted Imperial Valley turns out half a million bales of cotton this year. Southern California is much less than half the State in area—it is only as large as all six States of New England, with two Delawares thrown in. And with all its relative femininity as beside the North, it has the trout-brooks of Maine and the Valley of the Nile (in the delta of the Colorado River); nobler



HERMIT'S CABIN

A bit of primitive life near Los Angeles



HIGH SCHOOL, SO. PASADENA

An example of the fine structural art of Southern California

trees in its mountain forests than ever grew east of California; such hundred miles of all-the-year beaches, such magic islands, such harbors, such gamut of air, scenery and product as are literally incredible until seen. No wonder that within five years Los Angeles County has become "Capital of the Moving-Picture World." Not only can the film operators work here all the year round; they can "stage" Palestine, Italy, Colorado, Egypt, or almost any temperate or tropic land. If you see a "movie" of "Julius Cæsar" or "Ben Hur" or Assyria or the Holy Land, the chances are ten to one it was "staged" in Southern California.

Population and Growth

The populations of California north and south are as unlike as those of Boston and Richmond—but here the F. F. V.'s are in the north, the

Yankees in the south. San Francisco is the only typical "Western" city left on the continent. Los Angeles is not "Western" at all, but "more Boston than Boston." A larger proportion of its people are of the old strain of New England and its migrations—northern New York, "the Western Reserve" of Ohio, and that northerly tier, clear to Minnesota. At a recent picnic of Iowans in Los Angeles County there were present more Iowans than the total population of the second city of Iowa itself.

This seems to be the straight answer when Eastern people look incredulous at the reports of our development. Seven-tenths of us are recent Easterners; with money to travel, somewhat; with education enough

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to wish to stir; with the mental independence to be able to *change*.

Back there it was expensive to change. Out here they had a free hand—and they did what they had been thinking. The city of Los Angeles, when I walked into it, had 12,000 people. It now has 600,000. It was the first city in the world whose streets were lighted throughout with electricity. It had cable and electric cars when horse-cars still ran on Broadway, New York. Southern California has today the best and longest urban and interurban transit in America. Its lines would serve from Boston to Chicago. I have “railroaded” many million miles; but the other day, for the first time in my life, I reeled off curves at seventy miles an hour—and as easy as a rocking-chair.

Mindful of old Dobbin and his sorry roads, the newcomers have made Southern California the paradise of the automobile. There is the great State Highway; but in Southern California there are a thousand miles of city and county boulevards, over which you can drive at fifty miles an hour—unless the “speed cops” catch you, as they are reasonably sure to do; for the fines for exceeding the “limit” go far toward the municipal expenses of many canny towns. Within five years this marvelous system of boulevards has been constructed. No wonder there are more automobiles per capita than anywhere else—the auto demanded the good road; the good road multiplied the auto. There were over 200,000 licensed machines in California in the first six months of 1916—twice as many in Southern as in Northern California. Telephones? Southern California has a half more per capita than any other region in the world. I remember “farming as she was farmed” in my native State. The winters, the droughts, the



COURT OF MISSION INN

A favorite resort and one of the beauty spots of Riverside



AVENUE OF PALMS, LOS ANGELES



THE BROAD OCEAN BOULEVARD
Leading from Los Angeles to Venice

sunstrokes, the slush, the mud, the loneliness. Here, the farmer has bathtubs, plumbing, piped water, a 'phone which connects him with his neighbor, the market, the cities and towns within 500 miles; probably electric light; either his own car or a swift electric near, so the big city is only an hour away; church, public library and school right at hand. And I wish every Board of Education in the East could be transported to inspect the high schools in the little towns of the San Fernando Valley, where ten years ago the only architecture was sage-brush, and the only citizens jack rabbits. This is eminently true of all Southern California—now the Land of the Transplanted Yankee. Perhaps I need not say that the standards of these schools are in keeping with their buildings. Worthy pupils of the "Little Red Schoolhouse" did better when they had the chance.



THE PLAZA, SAN DIEGO

Irrigation

Remembering also that it was inconvenient to lose a year's crop if the rains forgot to come, these Graduate Easterners took the regulation of the rains into their own hands. The vast wheat and barley fields depend on the season; but the vital crops of Southern California are *insured*. We bore a hole a few hundred feet—or even two thousand—and up spurts a brook, perhaps ten feet in air; and we guide it down appointed channels to every tree and flower—and if a drop of rain didn't fall in a year, the flower and tree would never mind. The Indians of the Southwest, more than a thousand years ago, knew enough to irrigate. The Spaniard and the Mexican followed this insurance. We have im-



PALM AVENUE, PASADENA

proved upon it. I have seen the East, from Kansas to Maine, scorched with drought—and enough wetness running in their watercourses to give drink to every acre in our national domain. Out here, we have made farming (as the motto of the National Irrigation Congress has it), "Science, not Chance."

As Los Angeles grew near the limit of its visible water-supply, it calmly went to Mount Whitney; and tunneled mountains and bridged

SOUTHERN CALIFORNIA

valleys, and brought a river about the normal size of the Merrimac, the Scioto or the Passaic, to its doors from as far away as from Boston to New York, or New York to Washington.

It was first to harness the waterfall to little copper wires that pull a million passengers a day and light a million people a night, hundreds of miles away from the leaping waters that do the work. The first long-distance transmission of water-power was in Southern California—and here still are the longest systems.

Oil Wealth

Foremost in the modern application of electricity, Southern California also leads the world in "getting the good" of oil. In 1875 the greatest of American geologists (Whitney) wrote that while there were surface indications of petroleum in California, the geological formation made it impossible that the industry should ever become important. Particularly, there could be "no flowing wells like those of Pennsylvania."

Today Southern California is the largest oil-producer in the world, with forty million barrels a year. There are hundreds of "gushers"; and whole valleys are dammed to hold the spurting flood of petroleum. The "Lake-view" well alone, spouting *fifty thousand barrels a day*—an unremitting black geyser thundering 250 feet in the air, and worth \$25 a minute (or \$36,000 a day) to its owners for months—set the world's record.

But the petroleum of Southern California (and the production is nearly all in this end of the State) is much more important than for its mere revenue—though this equals that of all the other mineral products, or of the oranges and lemons. It is the most extraordinary factor in the progress. The millions of dollars' worth of "good roads" I have mentioned are made from the granite gravel of the hills, raked in and steam-rolled with the petroleum from the wells. It makes a boulevard equal to asphalt paving, at a fifth the cost. The railroads burn petroleum—so there are



CORONADO BEACH
Looking from the Hotel down the "Silver Strand"



"THE ARROWHEAD"
A natural scar on the mountain near San Bernardino

no cinders in your eye. The roadbeds are "watered" with petroleum—so there is no dust. Factories, hotels, newspapers, steamships—all run by petroleum. I rode on oil-burning locomotives in Peru twenty-three years ago; but Southern California was first in the United States to adopt this wonderful improvement. Hundreds of miles of pipe-lines, with relay pumping-stations, convey the black, sluggish oil from the wells to railroad or ship. On the Ventura County coast you will even see *oil-wells drilled in the ocean floor*, and pumping their greasy gold from the end of long piers. The dry out-cropping of this petroleum mended the stone utensils and water-proofed the baskets of the swarming aborigines a thousand years ago, and even enabled their beautiful inlays and mosaics in soapstone. The exhibit of the arts and crafts of the Southern California prehistoric "savages," shown in the Southwest Museum (Los Angeles), is a wonder, not only for its skill of hand, but its art feeling.

This same "brea" (out-cropping asphalt) water-proofed the first churches and schools in California, in 1769. Two hundred thousand years ago it served a stranger function—and even more important to science. Within the city limits of Los Angeles are the unique "pits" of the old Rancho La Brea. In those prehistoric days, Southern California was a tropical forest, peopled with the "imperial elephant" (several times as big as Jumbo), the giant sloth, the great saber-tooth tiger, with tusks six inches long, and many other creatures unknown for ages except to geology. Through a crack in the earth's crust slowly oozed up, in a hollow, a pond of thick asphalt, covering perhaps an acre. In rains, water gathered on this sticky surface—today you can still see the petroleum bubbling up in the pond and around its banks.



OIL WELLS IN LOS ANGELES



A "GUSHER"

SOUTHERN CALIFORNIA

In the dry summer the elephants came here to drink; and waded in and "bogged down" in that oily quicksand. And the great tigers sprang from shore upon their helpless backs and ate of them alive. And other tigers disputed the prey, and fell off into the same death trap. I have myself seen rabbits and owls thus caught within the week. And slowly the asphalt covered its victims—thick as you could pile jack-straws. The bones are perfectly preserved. Thousands of these extinct skeletons have been exhumed in half an acre. Hundreds have been cleaned, identified, and "set up," and are now on exhibition. It is beyond comparison the most wonderful and important "find" ever made by science in the prehistoric animal kingdom. Of course man does not enter.

So, you see, petroleum means something to California. The State has produced fifteen hundred million dollars in gold; but its oil is already a greater factor. By the way, gold was found and "washed out" in Southern California eight years before the "discovery" at Sutter's Mill, which set the world afire in 1848.

Romance of California

But Southern California has an even greater asset than oil and oranges and gold. Greater, indeed, than all of them put together.

That is its *romance*. Its Italian skies, its Grecian coastline, its Alps, its dream-like valleys, its beckoning climate—not all these together are more potent than the magic of its story. Out of every hundred thousand visitors, not 600 visit the historic gold-mines of '49, immortalized by Bret Harte and Mark Twain. Not 2,000 visit any of the oil-fields which have



"REAPING" SALT
In an ancient inland sea



CABRILLO BRIDGE, BALBOA PARK
A beautiful bit of San Diego scenery

changed the markets of the world. But practically every one of them visit some of the old Missions—and 10,000 of them make pilgrimage to all that line of noble monuments. Thousands of automobiles a day traverse "El Camino Real" (the King's Highway), now no mere footpath for sandaled friars, but as perfect a road as there is in the world. They cannot hear too much of Junipero Serra, the wonderful Apostle of California, who founded these Missions, on this far shore, while the War of the Revolution was still in the balance.

The Home of Ramona

Nor can they get enough of "Ramona." When I was city librarian of Los Angeles we had 100 copies of that extraordinary "purpose novel" of Southern California—and there was always a long waiting-list to find a copy "in." The book's characters are pure fiction—though you may be shown a dozen birth-places and marriage-places of her, and even a toothless old squaw for

"Ramona" herself—but the scenes are photographically true; and so is the story of our sins against the first Americans in Southern California. The "home of Ramona" was the Camulos Rancho, the last of the old California principalities. I remember it as, a third of a century ago, the most ideal patriarchal home in all the three Americas. All were welcome who came. It was the last stand of old Spanish California—when you could travel from San Francisco to Valparaiso without a letter or a dollar; and at every palace or house or hovel you were sure of hospitality, fresh clothing, a fresh horse, money (if they had any) and board and lodging for as long as they could gently coerce you to stay.



THE BELLS OF SAN GABRIEL



INTERIOR OF SAN GABRIEL MISSION



CHURCH NEAR SAN DIEGO

Where, according to the story, Ramona was married

California Atmosphere

From this patriarchal era and the mission era, which mothered it, comes that strange "atmosphere" which most of us do

SOUTHERN CALIFORNIA

not realize, even as we breathe it. The old Missions were not "just churches," but also industrial schools, where as many as 3,000 converted Indians at a time in each learned to be carpenters, masons, weavers, tanners, soapmakers, and every other homely craft of civilization. The half-century since Mexico pillaged them wrecked nearly all; but their spirit is alive in this material age; and the Landmarks Club has already re-roofed an acre and a half of their buildings, and restored half a mile of their walls, and is working harder than ever.

California has had a long and romantic story. It was discovered half a century before any part of our Atlantic seaboard. It has been peopled and dominated by three nations; has changed the standards of the world in money, agriculture and fuel; has caused the two most marvelous migrations in American history—and it is "just started."



SAN FERNANDO MISSION

The young girl is the great granddaughter of the last Administrador (manager) of the Mission in 1834

CAMULOS
The Home
of the
Gentle
Ramona



CAMULOS
The Last of
the Old
California
Rancho
Homes

SUPPLEMENTARY READING

TWO YEARS BEFORE THE MAST

A most interesting account of Southern California in the early days. *By R. H. Dana*

IN AND OUT OF THE OLD MISSIONS OF CALIFORNIA. Illust. *By George Wharton James*

THROUGH RAMONA'S COUNTRY. Illust. *By George Wharton James*

CALIFORNIA, ROMANTIC AND BEAUTIFUL Illustrated *By George Wharton James*

CALIFORNIA: AN INTIMATE HISTORY *By Gertrude Atherton*

ROMANTIC CALIFORNIA. III. *By E. C. Peixotto* GUIDE TO SOUTHERN CALIFORNIA *By J. W. Hanson*

GLIMPSE OF CALIFORNIA AND THE MISSIONS *By H. M. H. Jackson*

THE MISSIONS OF CALIFORNIA AND THE OLD SOUTHWEST *By J. S. Hildrup*

THE STORY OF CALIFORNIA. A brief, interesting, popular history. *By Henry K. Norton*

A TRUTHFUL WOMAN IN SOUTHERN CALIFORNIA *By K. A. Sanborn*

* * * Information concerning the above books may be had on application to the Editor of The Mentor.

T H E O P E N L E T T E R

The picture on this page offers us the distilled essence of Southern California. It shows the cultivated desert land, the great mountains, the Franciscan Mission, and the picturesque palm tree. No tourist, however unobserving, can fail to note these four features. For my part, I cannot believe that any individual can travel through that country and remain unobserving, for Southern California is an arena of wonders and surprises. Whether it be the work of nature or of man, it is just one strange thing after another. That is what keeps the visitor interested. He is ever looking for "the next thing" in the way of soil products, scenery or human achievement.

★ ★ ★

And the changes of physical conditions are so sudden! As we leave Barstow on our way to Los Angeles, we are in the midst of the Mojave Desert. After winding through a pass in the mountains we descend 2,700 feet, all in 25 miles, and run into San Bernardino, where we find ourselves at once in the garden of California. The contrasts are sometimes more abrupt than this. From what seems to be the very heart of the desert we ride, in the course of a few rods, into a town where the streets are well paved, the lawns are fresh and green, and the houses nestle in the cool, dense shade of overhanging trees. The transition from a smooth-finished street to the sands of the desert is one of only a few yards. Again, we are surprised when in an exclusive section of Los Angeles and admiring the homes of luxury and leisure located there, we find ourselves suddenly gazing upon an extended area where black oil derricks bristle in countless number.



SOUTHERN CALIFORNIA
The Mission of San Fernando Behind Its Palms

And when riding through the shaded streets of Pasadena, with our hearts warming to the thought of what a lovely residential spot for human beings it is, we come suddenly upon—an ostrich farm.

★ ★ ★

The answer to most of the contrasting geographic conditions is, of course, *irrigation*. Water has worked wonders. A number of years ago, so it is said, they served water there "by the teaspoonful." Today it is pumped up from wells or led down from the mountains into reservoirs, and delivered to plantations and individual consumers just like gas and electricity. The development and expansion of the irrigating system of California are amazing. And how quick and effective the work of water is! The soil has been slumbering there for years, storing up riches, and dreaming of the time when man would come to waken it with life-giving water. When the water is turned on, the landscape is transformed as if by magic.

★ ★ ★

Mr. Lummis has called attention to the representation in California of other States. Many people who go there to visit end by staying. On the Cabrillo Bridge, in Balboa Park, San Diego, I met two middle-aged people who had gone out to the Coast, and could not make up their minds—and hearts—to leave. "We came to see Southern California two years ago," they said, "and we are still here. There are thousands like us." And indeed my own feelings were much like theirs, for I found it hard to turn my back on that fair summerland. I was glad that I left on a night train, for then there was no looking back. Under the folds of darkness the beauty of it all passed away "like a dream that is told."

W. S. Moffat





THE art of constructing sun-dials is called *gnomonics*, and has been cultivated from remote antiquity. King Ahaz, whose dial is mentioned in the Old Testament, is supposed to have flourished in the eighth century B. C., and the Hebrews of his time probably acquired the art of dial-making from the Babylonian astrono-

mers. Vitruvius, the celebrated Roman architect and engineer, writing in the first century B. C., enumerates thirteen forms of sun-dial in use in his day, including some that were portable.

This art was revived after the close of the Dark Ages, and in the sixteenth and seventeenth centuries of our era attracted the attention of a great many able artisans and mathematicians, who have left us some learned works on "dialling." Dials not only were more accurately constructed than ever before, but assumed an endless number of new forms. Under the reign of Charles II, of England, there was set up in the royal garden at Whitehall a monumental construction which included nearly three hundred sun-dials, of seventy-three different varieties.

The sun-dial has so many precious associations—historic, artistic and sentimental—that it can never go out of fashion. A sun-dial is an essential part of a formal garden; it adds a graceful Old World touch to the wall of a dwelling; and, in its more pretentious monumental forms, it serves as a dignified adornment for a public square or park. This latter use has been somewhat neglected in this country, where ideas in monuments run too exclusively to portrait statues.

The erroneous idea seems to be prevalent that sun-dials, however meritorious they may be as ornaments, are practically useless as timekeepers. It is true that the sun-dial sometimes disagrees with clocks keeping time by an imaginary sun

("mean solar time"), but with respect to the real sun the dial, if properly constructed and set up, is always exactly right. It is not subject to any of the moral lapses of which clocks are guilty. Moreover, the process of reducing sundial time to mean local time, or to standard time, is simplicity itself. In many of these instruments a table of the "equation of time," showing the correction to be applied at any time in the year, is engraved on the face of the dial. There are some dials with mechanical devices for performing this reduction, and there are also dials that can be easily adjusted for use in any latitude.

No sun-dial is quite complete without a motto, and the literature of sun-dial mottoes vies in interest with that of epitaphs. In Mrs. Gatty's great "Book of Sun-dials" will be found upwards of sixteen hundred such mottoes, collected from far and near. These inscriptions most frequently have a more or less somber tone, reminding the passer-by of the fact that time flies and life is short. Many, however, strike a more cheerful note. The motto in which the dial boasts of counting "only the sunny hours" is perhaps the commonest.

The subject of our gravure is a charming specimen of the "vertical dial," in monumental form. It was presented to Princeton University in 1907 by the Right Honorable Sir William Mather, of Manchester, England, and is an exact copy of the Turnbull sun-dial at Corpus Christi College, Oxford.





THOUGH the cheapness of clocks and watches has banished hour-glasses from the familiar place they once occupied in the daily life of mankind, their general appearance is so well known to everybody as to require no description. This device continues to be depicted by artists, along with the scythe, as the regular

attribute of Old Father Time, and it also has other symbolical and decorative uses.

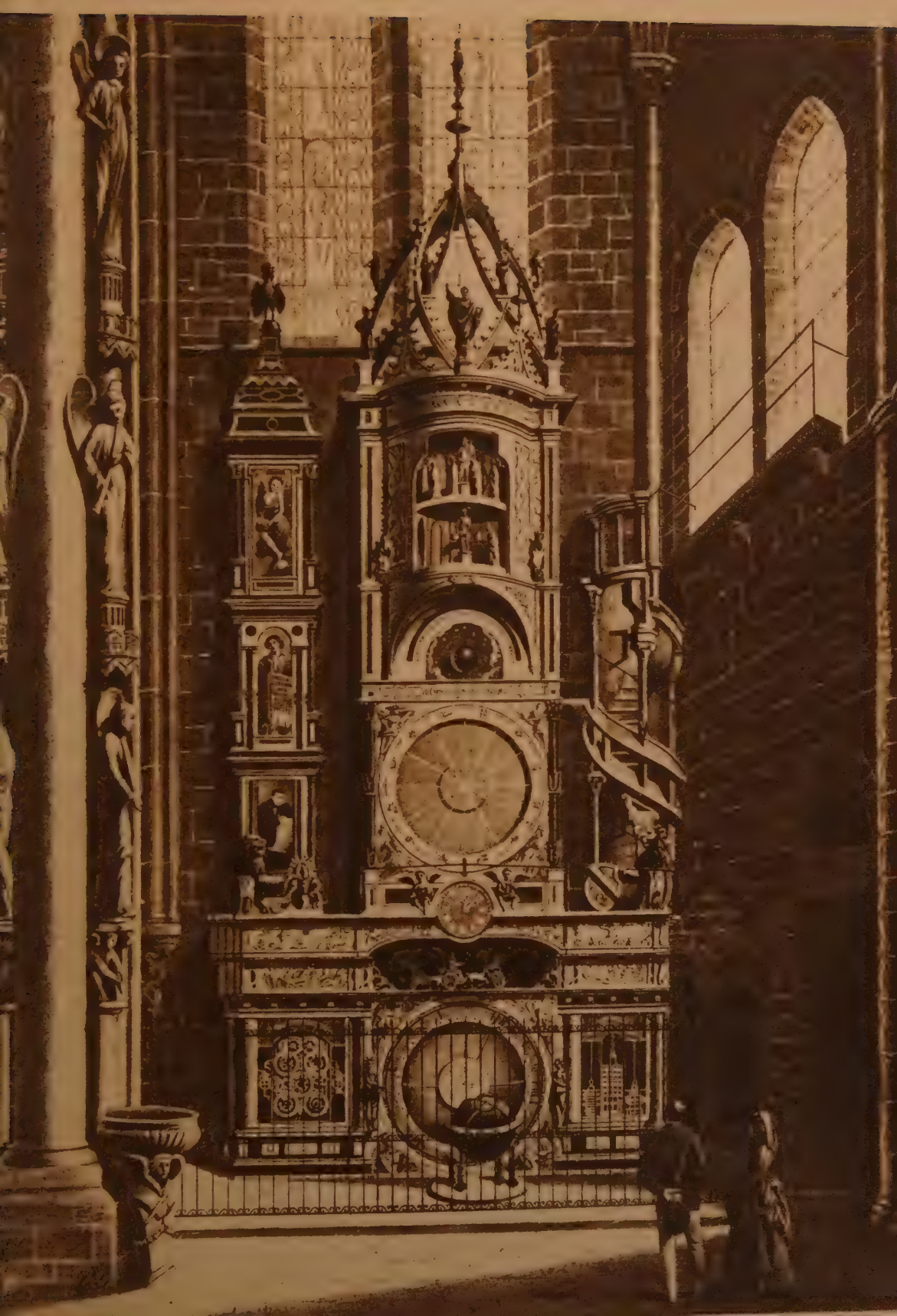
The hour-glass, properly so called, is only one form of the *sand-glass*, constructed in such proportions that the sand runs through in a single hour. The subject of our gravure is a two-hour glass. Three-minute glasses are still used in the kitchen to time the boiling of eggs. Half-minute glasses are used on shipboard in connection with the old-fashioned log-line, for determining the speed of the vessel. In the Old World sand-glasses are sometimes used to gauge the duration of telephone calls. In the British House of Commons a two-minute glass is turned just before a "division"—i. e., the withdrawal of the voters on the affirmative and negative sides of a question into separate lobbies to be counted—and while the sand is running the "division bells" ring throughout the building to give notice that a vote is to be taken in this manner.

Sand-glasses are designed on the same principle as the common *clepsydra* (*klepsei'-dra*), or water-clock, of antiquity, in which time was measured by the passage of a certain volume of water through a small orifice. In the *clepsydra* various expedients had to be adopted to make the rate of flow of the water independent of the pres-

ure at the orifice, which varied with the amount of water remaining in the vessel. Sand, however, provided it is pure and dry, runs through an opening in the bottom of the container at a uniform speed, regardless of the pressure. In the best hour-glasses silver-white sand is used. Sometimes this is replaced by powdered egg-shell.

Just as the ancients used the *clepsydra* in their law-courts to limit the time each advocate might speak, so the ministers of Puritan days kept an hour-glass on the pulpit to govern the length of their sermons. They generally considered themselves entitled to the full allowance of time measured by the running sands. Some, indeed, felt no compunctions about turning over the glass and imposing a second hour of spiritual admonition upon their hearers. The use of a two-hour glass, implying an habitual discourse of that inordinate length, was, we hope and believe, unusual.

Old hour-glasses are often enclosed in frames of wood or brass of some artistic merit, and they are occasionally adorned with appropriate mottoes; but neither in the beauty of their designs nor in the variety of their inscriptions do they rival the sun-dial.





THE most celebrated clock-makers of today are those whose clocks keep the best time. Centuries ago the clock-maker who wished to achieve renown devoted his ingenuity to introducing into his timepieces all sorts of elaborate and spectacular devices, such as apparatus for indicating the movements of the heavenly

bodies, and a variety of automata, in human or animal form, which performed their evolutions at certain hours of the day. Many remarkable clocks of this description have survived to our time, and are still in working order, though some of these have undergone so much reconstruction that they are essentially modern productions.

Perhaps the most famous timepiece in the world—certainly the one most sought out by tourists—is the *astronomical clock* in the Cathedral, or Minster, of Strassburg. In its present form it is not very old, as it was constructed about 1840, but it is the successor of two timepieces of more or less similar design, one built in 1352 and the other in 1574. Parts of the latter were used in making the present clock. The best time to visit this clock is noon, local time (differing by half an hour from the standard time used in Strassburg), when one may see the procession of the twelve Apostles and the very realistic performance of a great cock, who flaps his wings, ruffles his neck and crows three times. Numerous other figures play their parts in the spectacle. The Strassburg clock is equipped with wonderful mechanism for showing the time of occurrence of astronomical phenomena, such as the rising and setting of the stars, eclipses of the sun and moon, etc.

A clock of this sort was built at Prague, in Bohemia, in 1419, and it is related that, when the timepiece was completed, the maker's eyes were put out, in order to prevent him from duplicating his achievement elsewhere. The story goes on to

record that the ill-used artisan, shortly before his death, obtained permission to visit the clock; whereupon he removed an essential part of its mechanism, and nobody could be found skillful enough to restore it. This identical story, however, is met with in other parts of Europe, not only in connection with clocks, but with various other mechanical contrivances.

Even more elaborate than the two timepieces just mentioned is the astronomical clock at Olmütz, Austria, built in 1420 and reconstructed in 1898. It is fifty feet in height, and fills a niche on the north side of the town-hall, where its performances attract throngs of spectators. The mechanical figures include a company of angels, who play upon *claves*, a procession of priests and acolytes, the three Wise Men of the East, with their attendants, and many other legendary and historical characters. Numerous dials show, in addition to solar and sidereal time, various details of the calendar and of celestial phenomena.

Mechanical figures for striking the hour on bells are commonly seen on public clocks, and are sometimes called "*Jacquemarts*," or "*Jacks*." Some of these are very ancient. They appear, in fact, to have been in use before the introduction of clock-dials; for the earliest timepieces driven by weights (as distinguished from water-clocks) were probably intended only to strike the hours, and not to show the time in any visible way. The two bronze giants surmounting the clock tower in the Square of St. Mark, Venice, are a familiar example.





WATCHES, though they vary in size, are nowadays nearly uniform in shape; but three or four centuries ago they were made in an endless variety of forms. Some were spherical, and were worn suspended from the girdle. Others were cylindrical. In the sixteenth and seventeenth centuries they were often made

in the shape of crosses, skulls, animals, books, flowers, fruits, sea-shells—and what-not. Watches in a flattened oval form were known as "Nuremberg eggs," from their shape and place of origin. Watches incrustured with jewels or adorned with exquisite paintings are found in all large collections.

The earlier watches were not usually meant to be carried in the pocket, but were displayed as much as possible to public gaze. It has been suggested that the fob, or watch-pocket, was introduced by the Puritans, whose habits of mind would lead them to value a timepiece for its utility rather than its beauty. The earliest fob chain known is attached to a watch of Oliver Cromwell's, now in the British Museum. Watch glasses were introduced about 1610.

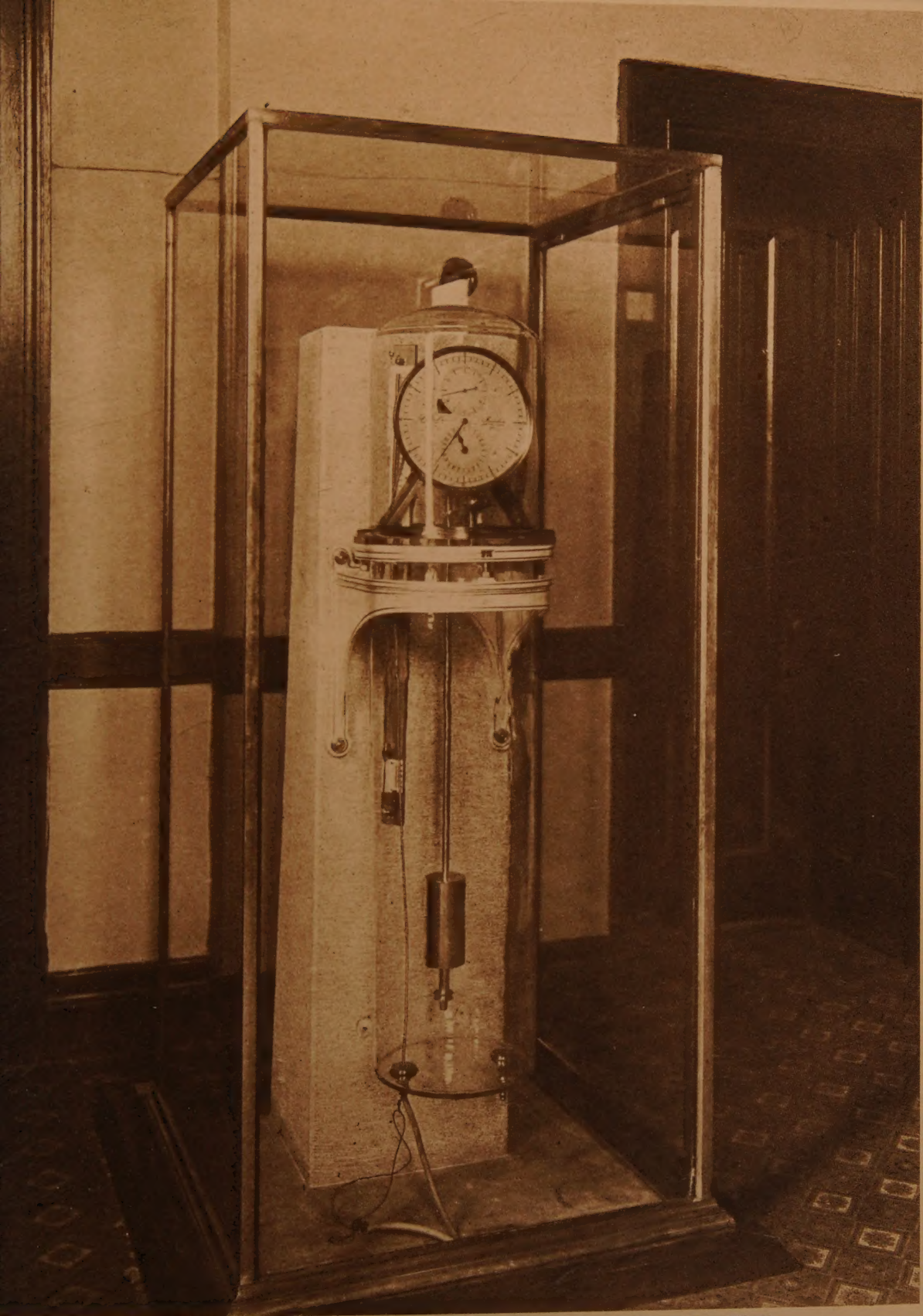
Watches have been made with "calendar works," for showing the day of the week and the date; with musical boxes, which play tunes every hour or may be made to play at will; and with a great variety of moving figures. "Repeaters" are watches that strike the hour and quarters (or minutes) when a handle is pressed; they were much used for getting the time in the dark before the invention of lucifer matches. Self-winding watches have been made in several forms. In some of these the winding is done by the operation of opening and shutting the cover (of a hunting-case watch) a few times a day. The "pedometer" watch is wound merely by the motion of the wearer's body. A remarkable self-winding watch was constructed on the latter principle in the eighteenth century, by the French maker Breguet. Its works were all made of gold instead of brass, and it had a glass face, through which these could be seen. It

was a "repeater," telling hours, quarters and minutes, and was equipped with a perpetual calendar, an equation of time register and a thermometer. The subject of curious, elaborate and ornate watches is, in fact, almost inexhaustible.

In recent times the art of watch-making has developed on the practical rather than the artistic side, and the most notable progress has been due to the introduction of watch-making machinery in place of hand labor. This is America's great contribution to the industry. Machine-made watches were first produced by A. L. Denison, of Boston, about the middle of the last century. Machinery has enormously increased the production of watches and converted what was once a costly luxury into an everyday necessity. There are single establishments in this country that turn out more than 2,000 watches a day.

One of the latest additions to the activities of the United States Bureau of Standards, in Washington, is the testing of high-grade watches, along the same lines as those followed for many years by Kew Observatory, in England. There are two classes of these tests, one extending over fifty-four days and the other forty days, the fees being five dollars and three dollars respectively. Full details on this subject, together with much useful information regarding the care of watches, will be found in the Bureau's Circular No. 51, sold by the Superintendent of Documents, Washington, D. C. (15 cents.)

A watch should be wound once or twice a day, and always at about the same hour. The practice of winding it up a little at a time, often absent-mindedly, whenever you take it from your pocket, is not conducive to good time-keeping.



ASTRONOMICAL CLOCK AT UNITED STATES NAVAL OBSERVATORY, WASHINGTON

THE most perfect clocks are those used at astronomical observatories. One of these, in Berlin, has run for months with an average error of only fifteen one-thousandths of a second a day. In order to run so perfectly a clock must not only be constructed and adjusted with the greatest care, but must be installed in a

special room, such as an underground vault, where the temperature is practically uniform. It must also be free from jar or vibration, and must therefore be mounted on a heavy masonry pier. Lastly, it should always be kept under the same barometric pressure, and this may be effected by enclosing it in a glass or metal case, from which the air is partially exhausted. In order that the case may not be opened or disturbed the winding is done automatically by electricity, the frequency of the winding in some cases being as often as every minute. Only pendulum clocks can attain the highest degree of accuracy.

In the case of a portable timepiece it is, of course, impracticable to ensure such uniform surrounding conditions, and the pendulum must be replaced by the less reliable balance-wheel. Great efforts have, however, been made to produce accurate portable time-keepers, especially for the use of mariners in determining their longitude. In the year 1714 the British Government offered a reward of £20,000 (about \$100,000) for the invention of a timepiece that should enable a shipmaster to obtain his longitude within thirty miles at any time during a voyage from England to the West Indies and return. The prize was won by John Harrison, who, after thirty years of labor, invented a *marine chronometer* that fulfilled the required conditions. Subsequent inventors have greatly improved this instrument.

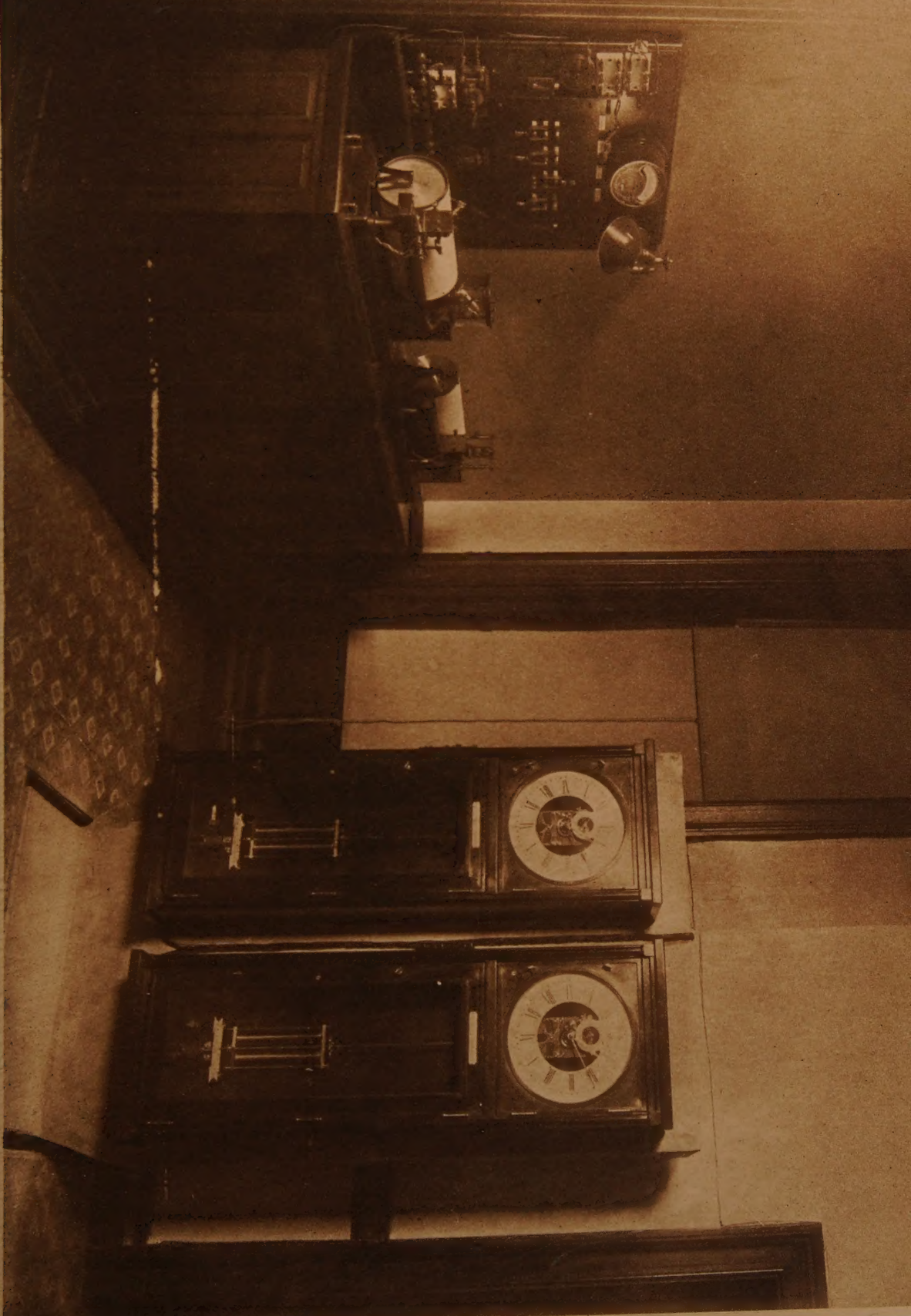
Ship's chronometers show the mean solar time of Greenwich, England, and are tested before leaving port, to determine whether they are running fast or slow, and how much. In order to get the longitude, the local time is first determined from the angular position of the sun (measured with a sextant), and this is compared with the time shown by the chronometer. The difference of time gives the longitude by

a very simple calculation. The importance of an accurate timepiece in this process may be illustrated by quoting from the late Professor E. S. Holden:

"If a ship leaves New York supposing her chronometer, which is regulated to Greenwich time, to be losing two seconds a day, while it is really losing six, every day she is really about a mile farther west than her reckoning shows her to be, and in a voyage of a month she will suppose herself to be too far west by thirty miles. Such a result may be attended by the most disastrous consequences."

Since the foregoing paragraph was written, however, a new agency has made it possible for the mariner to keep time at sea with an accuracy far exceeding anything that was dreamed of a generation ago. This is wireless telegraphy. There are now several high-power "radio" stations, in various parts of the world, including one on the Eiffel Tower, in Paris, and one at Arlington, Virginia, which send out time signals regularly twice a day, by which every vessel equipped with a wireless receiver may determine exactly the error of its chronometers. This is one of several ways in which radiotelegraphy has contributed to the safety of navigation.

The chronometer is quite similar in construction to a watch, but has a special form of escapement, too delicate for use in a pocket timepiece. A good chronometer costs from \$300 to \$500, and every large vessel carries at least three. Those used in our Navy are subjected to prolonged tests at the Naval Observatory before they are accepted, and the standard is so high that it is found difficult to secure enough satisfactory instruments to equip all naval vessels. Torpedo-boats and submarines carry a kind of timepiece called the *torpedo-boat watch*, which is less affected by vibration than the chronometer.





WHEN Alexander Pope compared men's judgments to their watches, of which "none go just alike, yet each believes his own," he left to posterity the record of a state of confusion regarding the correct time that has happily ceased to exist in most civilized countries. Thanks to the electric telegraph, accurate time is now

within the reach of almost everybody.

In the United States the fountain-head of information concerning "the time o' day" is the Naval Observatory, which crowns a hill overlooking the city of Washington. This institution is charged with the duty of testing all the chronometers used in the Navy, and also of operating time-balls, which furnish a visible time signal for the use of mariners at our principal seaports. The necessity for absolutely correct time in connection with these duties led the Observatory to undertake the incidental but really more important task of furnishing a time service to the country at large. Recently, with the aid of radiotelegraphy, this service has been extended far over the adjacent oceans, and mariners out at sea can now regulate their chronometers by the official time signals. The time service on the Pacific Coast is maintained by the observatory at the Mare Island Navy Yard, in California.

Our gravure shows the room at the Naval Observatory from which the time signals are sent out by telegraph twice a day—at noon and at 10 P. M., Eastern Standard Time. (At Mare Island the signals are sent at the same hours of Mountain, or 120th Meridian, Time.) To the right are the two signal clocks, only one of which is used, the other being held in reserve for emergencies. These clocks are mounted on massive piers, in order that they may not be disturbed by the vibrations of the building.

A few minutes before the signal is to be transmitted one of the two chronographs, seen on the stand at the left of the picture, is set in motion. This instrument is connected electrically with the astronomical clock of the Observatory, the error of which is known to a small fraction of a second from observations of stars, and is

also connected with the signal clock in such a manner that the seconds of both timepieces are registered by strokes of a pen on a revolving sheet of paper. A comparison of the two records makes it possible to set the signal clock to the correct time, after making allowance for the fact that the astronomical clock keeps "sidereal" or star time, while the signal is intended to show standard solar time.

The signal clock having been set, all is in readiness for sending out the signal. This signal is transmitted by the clock itself. At exactly five minutes before the hour a wheel on the axis which carries the second hand begins to operate a telegraph key, at intervals of a second, and at telegraph offices throughout the country the seconds are recorded by the sounders. Practically all other telegraph business is suspended while the signals are being received. In order to facilitate counting, the twenty-ninth, fifty-fifth, fifty-sixth, fifty-seventh, fifty-eighth, and fifty-ninth seconds of each minute are omitted, while during the last minute before noon and 10 P. M. the last ten seconds are omitted, and on the following sixtieth second—the final signal—the key is held down or the contact continued for a whole second. Time-balls in several cities are dropped automatically by this final long contact.

The same impulse from the clock which operates the ordinary telegraph instruments is transmitted over the wire to the great radio station at Arlington, Virginia, where it automatically sends out a "wireless" time signal.

The time signals, if received directly, are seldom in error by as much as two-tenths of a second, while the average error is less than five-hundredths of a second.